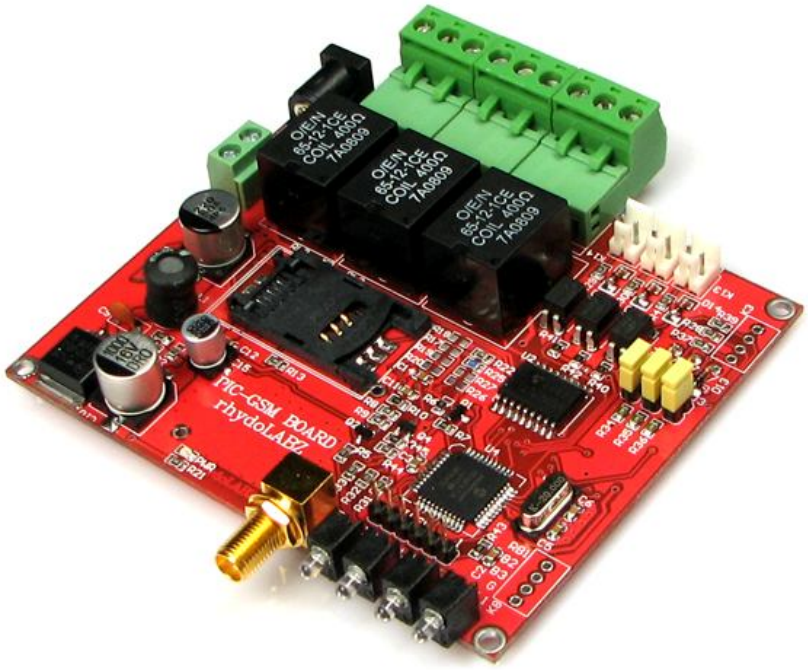
Document : Datasheet
Date : 05-Apr-10

Model # : GSM - 1402

GSM I/O - Relay Board

User Manual



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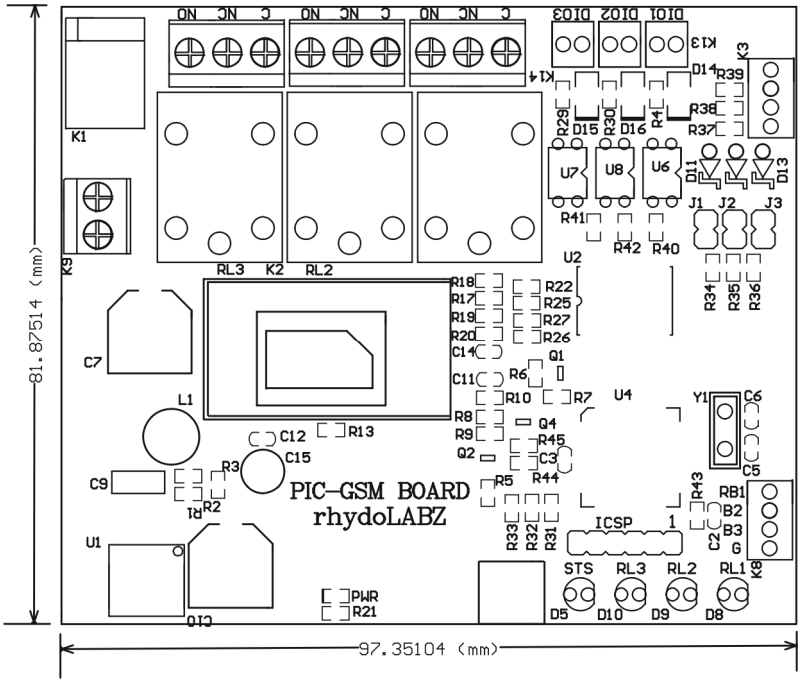
GSM I/O Relay Board is a great development board for cellular and remote monitoring applications. It is built with Triband GSM/GPRS engine. With it, you can easily monitor and control your home from anywhere there is cell phone coverage with your GSM cellular account. Insert any GSM SIM card and start accessing the board remotely over the cellular network via SMS/GPRS. Since it is built with powerful TCP/IP Stack, you can communicate with this board from anywhere in the world through internet also.

It is having 3 Relay ports, 3 Optically Isolated Digital Inputs, 3 Digital I/O and 3 Analog I/P (10 bit) multiplexed with 3 nos 4-20ma current measurement channels. Out of the box you can switch ON and OFF relays remotely by SMS/Internet, measure the Analog value like line voltage/ temperature at home, monitor and toggle the status of any GPIO pin. The Panic button and alarm inputs at your home/office can dial your phone and report for alarm or to send you an SMS message.

FEATURES

- GSM/GPRS Tri-Band module 900/1800/1900Mhz
- Built-in TCP/IP Stack
- Onboard SMA Connector for Antenna
- PIC16F877A LQFP
- Quartz crystal 20Mhz
- Three relays 10A/250VAC
- Three Isolated Digital inputs
- Three Digital I/O's
- Three 10 bit Analog input
- Analog I/P Can convert to 4-20ma current measurement
- Switch Mode power supply for GSM Engine
- 5V Voltage Regulator
- Relay Status LED indicator with LED Standoffs
- Power Adapter/Battery Connector
- EXT connector for Digital IO/Analog
- FR-4, 1.5 mm (0,062"), Red solder mask, white Legend print
- Dimensions: 100x80 mm (3,9x3,15")
- Four mounting holes 3.3 mm (0,13")
- ICSP/ICD connector for programming and debugging

DIMENSIONS



BOARD FEATURES

Input Pins: The board has three pins in the connector **K13** (DIO1, DIO2, DIO3) that can be configured as Input.

Input/Output Pins: Three pins in the connector **K8** (RB1, RB2, RB3) can be configured as Input or Output as per the user requirement.

Relay-LED: The Relay and LED's uses the same pins (RD0, RD1, RD2) marked RL1, RL2 and RL3.

Voltage/Current Measurement: Three pins (RA0, RA1, RA2) are used to measure voltage/current. They should be configured as input ADC Channels. The input can be given at pins in the connector **K3.** For **measuring current, appropriate jumpers** have to be inserted at **J1, J2** and **J3**. Then the board converts current to respective voltage levels.

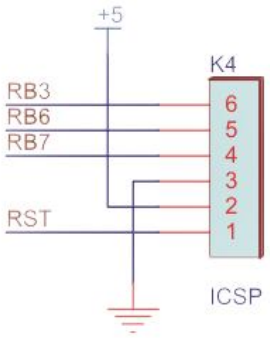
POWER SUPPLY

- Use 12V AC/DC Power Adaptor (Input 100-240V AC) or External power supply through Screw Terminal

Parameter	Condition	Specification		Unit
		Minimum	Maximum	
Supply Voltage - Adaptor	Vcc	12	12	V
Supply Voltage – DC Source	Vcc	10	15	V
Current Consumption		250	1000	mA

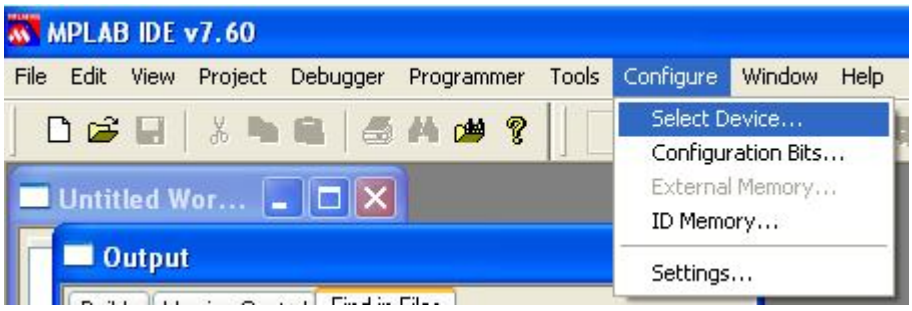
PROGRAMMING THE GSM I/O BOARD

The microcontroller in the GSM I/O Relay Board is PIC16F877A from Microchip. The hex files compactable for this microcontroller can be downloaded to the board. The programmer connection is given below.

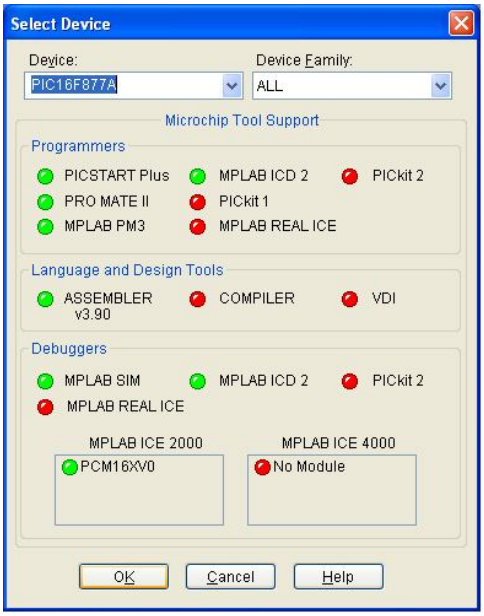


This session describes the programming steps using the MPLAB software. The hex code is developed using MPLAB and Hi-Tech PIC C Compiler from Microchip. The trial version of this software can be downloaded from the Microchip website. The programmer used is MPLAB ICD 2 from Microchip.

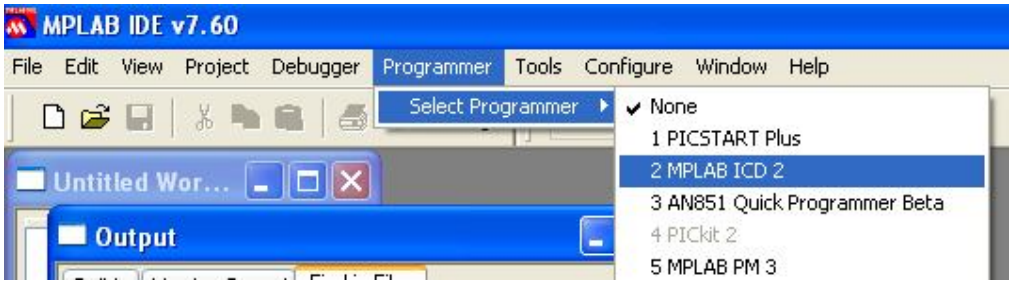
1. Power the GSM I/O Board.
2. Connect the programmer to ICSP/ICD Connector of the GSM I/O Board and open the MPLAB Software.
3. Go to Configure Menu and Click "**Select Device**"



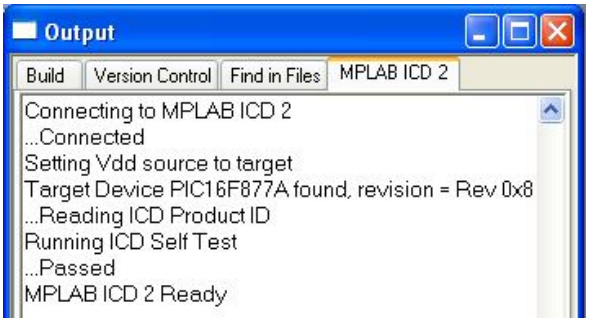
4. Select the device as PIC16F877A



5. Go to Programmer menu and Select Programmer as "**MPLAB ICD 2**"

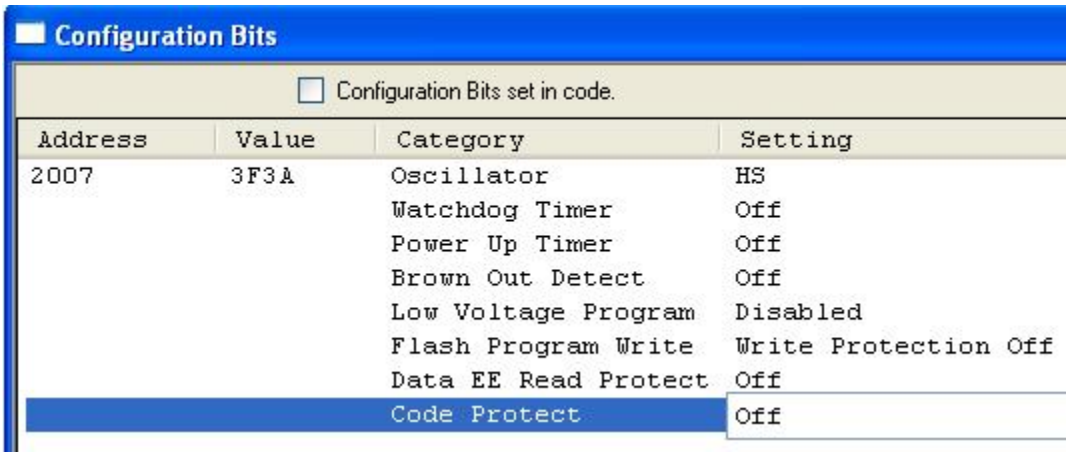


6. Wait till "**MPLAB ICD 2 Ready**" message appears in the Output Window

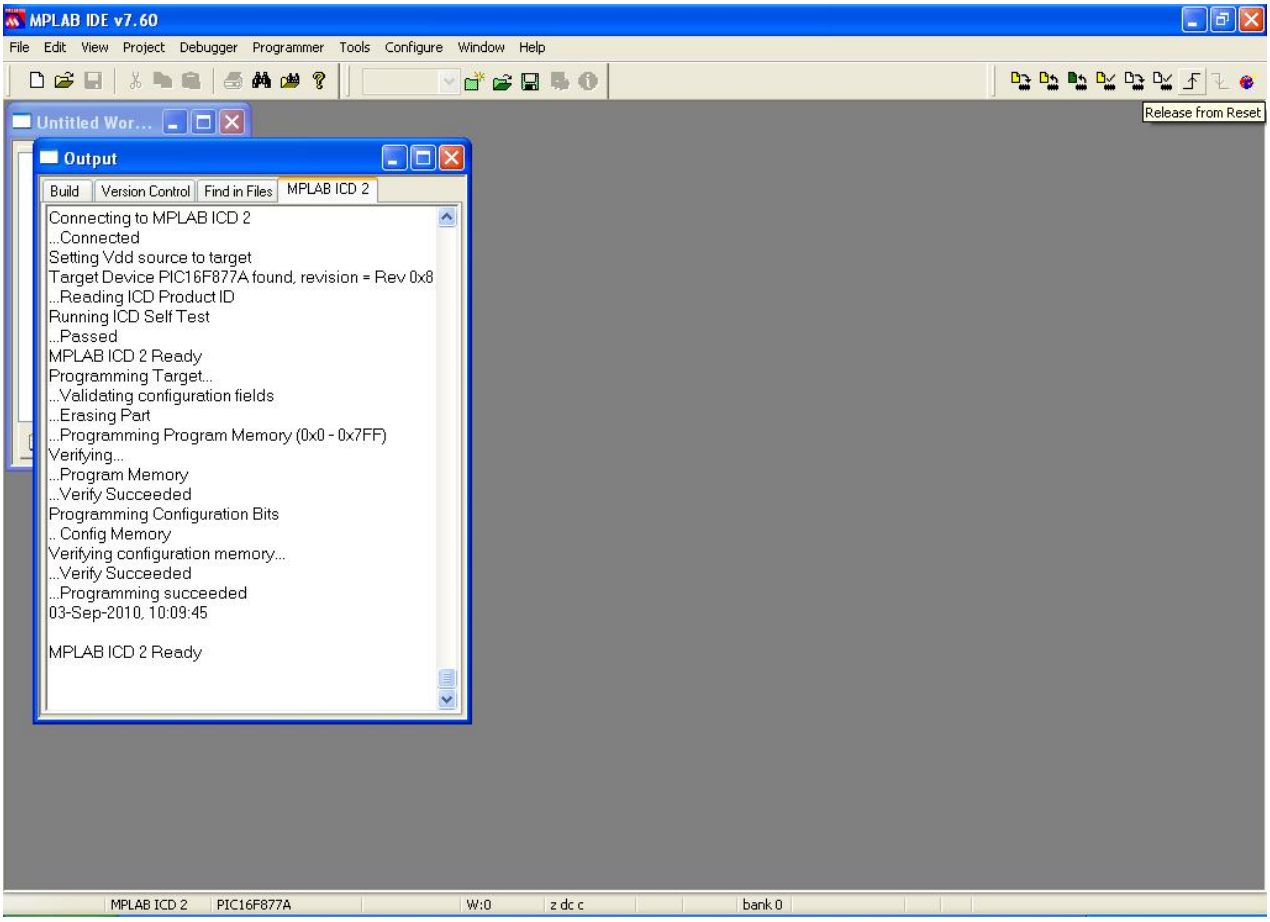


7. Go to File Menu, Click "**Import**" and Select the **.hex** file you wish to download from the desired drive.

8. Set "**Configuration Bits**" from "**Configure**" Menu as listed below.



9. Click the "**Program**" Button or Select "**Program**" from the programmer menu to download the hex code to the Board.
10. Wait till programming finishes. After the programming, click "Release from Reset" button.



BASIC COMMANDS FOR SMS

The Modem is controlled by the host controller using **AT** (Attention) Commands.

The format of an AT command from the HOST to the module shall be: **< AT command><cr> <lf>**
The format of the OK code from the module to the HOST shall be: **OK**
The format of the ERROR code from the module to the HOST shall be: **+CME ERROR: <err>**

COMMAND	**AT\r\n**
DESCRIPTION	Check whether communication is established
RESULT CODE	OK

COMMAND	**ATE0\r\n**
DESCRIPTION	Echo Off
RESULT CODE	OK

COMMAND	**AT+CMGF = 1\r\n**
DESCRIPTION	Switch to text mode
RESULT CODE	OK

COMMAND	**AT+CMGS=”Mobile Number”\r\n**
DESCRIPTION	Send SMS to the Mobile Number
RESULT CODE	>

COMMAND	**AT+CMGR=Sms Number\r\n**
DESCRIPTION	Read the SMS with message index number stored in the SIM card
RESULT CODE	+CMGR:"REC UNREAD","+919349750763", "0", "0",,"10/05/21,10:09:38+00' Message Data

COMMAND	**AT+CMGD= Sms Number \r\n**
DESCRIPTION	Delete the SMS with message index number stored in the SIM card
RESULT CODE	OK

Note : **<cr><lf> corresponds to Carriage Return and Line Feed (ie \r\n or 0x0d, 0x0a)**
Detailed AT Command set is given as a separate document.

SAMPLE CODE – FOR INTERFACING WITH MICROCONTROLLER

```
/* This program module sends an SMS from the modem to a prefixed number */

void main()
{
    SerialPortInit();                          /*  Serial Communication – 9600-N-8-1          */

    Send2Gsm("AT\r\n");                        /*  Transmit AT to the module – Module sends OK */
    DelayS(2);                                 /*  2 sec delay                                */

    Send2Gsm("ATE0\r\n");                      /*  Echo Off                                   */
    DelayS(2);                                 /*  2 sec delay                                */

    Send2Gsm("AT+CMGF=1\r\n");                 /*  Switch to text mode                        */
    DelayS(2);                                 /*  2 sec delay                                */

    Send2Gsm("AT+CMGS=\"+919447367176\"\r\n");          /* Send SMS to a cell number   */
    DelayS(2);                                          /* 2 sec delay                 */

    Send2Gsm("TEST DATA FROM RhydoLABZ-COCHIN");        /* Input SMS Data              */
    SerialTx(0x1a);                                     /* Ctrl-Z indicates end of SMS */
    DelayS(2);                                          /* 2 sec delay                 */

    while(1);
}
```

Function Description

SerialPortInit – Module to initialize serial communication parameters
Send2Gsm -- Module to transmit a string of data through Serial Port
SerialTx – Module to transmit a byte through serial port

GETTING STARTED

Insert SIM card
Open the SIM cardholder. After inserting the SIM card, lock the holder.
Connect Antenna
Screw the RF antenna on the RF cable output provided.
Power Supply
The board supports two power supply options - Using a power adaptor (9-12V) or from the screw terminal. You can use any of the options.
Network Led
The Network Led indicates the various status of GSM module eg. Power on, network registration & GPRS connectivity. When the modem is powered up, the status led will blink every second. After the Modem registers in the network (takes 50-60 seconds approx), led will blink in step of 3 seconds. At this stage you can start using Modem for your application.
Baud rate
The Baud rate supported by the modem is between 9600 and 115200. Make sure the microcontroller is set to the supported baud rate.

- *The GSM modem automatically sets to the baud rate of the first command sent by the host system after it is powered up. So there is no need for setting the baud rate using commands.*

- *Before you start using the GSM I/O Board, please make sure that the SIM card you inserted supports the needed features and there is enough balance in SIM.*

REMOTE CONTROL SOFTWARE FOR GSM I/O BOARD

- The software is supplied as a downloadable format (.hex). Newly purchased boards will be pre-loaded with this file. The user can reprogram the board with his executable codes.
- The configuration for the pins of PIC16F877A in the software are

Output Pins – PORTD 0-2 (RD0,RD1,RD2 for Relays and LED's)
PORTB 1-3 (RB1,RB2,RB3)
Input Pins – PORTA 0-2 (RA0,RA1,RA2 - Current/Voltage Measurement using ADC)
PORTD 4-6 (RD4,RD5,RD6)

- Power on the GSM I/O board after inserting the SIM card* and wait till the modem registers in the network.
- The system **checks for the modem and initializes it** by sending commands. If this communication is OK, **the LED and Relay** (connected to RD0) **will be ON** for a few seconds **at start up/reset** and will be OFF after the initialization is over.
- The board responds to the SMS send from the Administrator number** only. The Administrator number is stored in the permanent memory. The user can change/overwrite the number by means of an SMS*** from his/her mobile phone to the SIM in the GSM I/O Board.

The SMS format for setting the Administrator Number is **?ADMIN***
<Question Mark><ADMIN><Asterisk>

- After setting the Administrator number, the user can send SMS to the I/O Board from his mobile phone. There are various commands to ON/OFF the output devices. Also the user can monitor the status of all input and output devices including the converted digital value of the analog channels.
- The format of the SMS commands send from the Administrator Mobile is as follows:-

?DEVICE NAME!FUNCTION*
<Question Mark><DeviceName><Exclamation Mark><Function><Asterisk>

POINTS TO NOTE

**** Delete all SIM Messages (SMS) from the card before inserting it in the GSM I/O Board.***

***** The Administrator Mobile Number will be set by rhydoLABZ while testing the board. Remember to change the number before you start testing the software.***

****** The system accepts SMS data in Capital Letters only.***

EXAMPLE COMMANDS (TO BE SENT AS AN SMS)

1. Read the Status of all Devices

COMMAND	?DEV!STA*
DESCRIPTION	Read status of all devices, digital value of ADC channels and send these data as an SMS to the Administrator Number
RESULT SMS	*GSM I/O Board*Output Devices-Relay 1:OFF 2:OFF 3:OFF Dev1:OFF Dev2:OFF Dev3:OFF Input Devices-Dev1:ON Dev2:ON Dev3:ON Analog Pin-1:0082 2:0068 3:0069 rhydoLABZ

2. Relay - LED Control

COMMAND	?REL1!ON*
DESCRIPTION	Switch ON Relay–1 and LED

COMMAND	?REL1!OFF*
DESCRIPTION	Switch OFF Relay–1 and LED

COMMAND	?REL2!ON*
DESCRIPTION	Switch ON Relay–2 and LED

COMMAND	?REL2!OFF*
DESCRIPTION	Switch OFF Relay–2 and LED

COMMAND	?REL3!ON*
DESCRIPTION	Switch ON Relay–3 and LED

COMMAND	?REL3!OFF*
DESCRIPTION	Switch OFF Relay–3 and LED

3. Device Control

COMMAND	?DEV1!ON*
DESCRIPTION	Make PORTB Pin 1(RB1) High

COMMAND	?DEV1!OFF*
DESCRIPTION	Make PORTB Pin 1(RB1) Low

COMMAND	?DEV2!ON*
DESCRIPTION	Make PORTB Pin 2(RB2) High

COMMAND	?DEV2!OFF*
DESCRIPTION	Make PORTB Pin 2(RB2) Low

COMMAND	?DEV3!ON*
DESCRIPTION	Make PORTB Pin 3(RB3) High

COMMAND	?DEV3!OFF*
DESCRIPTION	Make PORTB Pin 3(RB3) Low

TECHNICAL SUPPORT

If you are experiencing a problem that is not described in this manual, please contact us. Our phone lines are open from 9:00 AM – 5.00 PM (*Indian Standard Time*) Monday through Saturday excluding holidays. Email can be sent to *support@rhydolabz.com*

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